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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/755,282

01/08/2001

Sheng-Hsiung Chen

TS99-149B

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28112

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10/04/2004

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EXAMINER

MITCHELL, JAMES M

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 10/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 09/755,282	<b>Applicant(s)</b> CHEN, SHENG-HSIUNG	
	<b>Examiner</b> James M. Mitchell	<b>Art Unit</b> 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 July 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 34-38 and 40-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 34-36, 38 and 40-48 is/are rejected.
- 7) ☒ Claim(s) 37 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

This office action is in response to the request for continued examination filed July 19, 2004.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 40, 42, 43, 46 and 48 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshioka (U.S. 5,357,136).

Yoshioko (Fig 2e) discloses (cl. 40) a bond pad structure for a semiconductor device, the structure comprising: an insulator layer (6) adjacent to a semiconductor substrate; a metal wiring layer (15) adjacent to the insulator layer; a passivation layer (14) adjacent to the metal wiring layer, wherein at least a portion of the passivation layer is configured to provide a plurality of island structures separated by spaces that expose a portion of the underlying metal wiring layer; a metal barrier layer (18) covering the passivation layer and the exposed portions of the metal wiring layer, wherein the metal barrier layer conforms to a shape provided by the island structures; and a metal pad layer (19) covering the metal barrier layer; (cl. 41) and the metal barrier layer is substantially the same thickness throughout the bond pad structure; (cl. 42) and the metal pad layer fills the spaces (i.e. fills remaining space not taken by barrier); (cl.

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43) wherein the metal pad layer is formed of aluminum (Col. 4, Lines 16-17); (cl. 46) further disclosed a first metal layer (15) overlaying an insulator layer (6); a plurality of vertical structures (space filled with item, 18) extending from the first metal layer upward and separated from each other by exposed portions of the first metal layer, wherein the vertical structures are formed from a passivating material (14); and a second metal layer (19) covering the vertical structures and the exposed portions of the first metal layer, wherein the second metal layer substantially conforms to a non-planer shape provided by the vertical structures (cl. 48) wherein the second metal layer is substantially the same thickness over both the vertical structures and the exposed portions of the first metal layer.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 40-44 are rejected under 35 U.S.C. 102(b) as being anticipated by Wollesen (U.S. 5,900,668).

Wollesen (Fig 5) discloses (cl. 34) a bond pad structure, comprising: an insulator layer (4) adjacent to a semiconductor substrate (1), a metal wiring (13) adjacent to the insulator layer (11), a passivation layer (11) adjacent to the metal wiring layer, wherein at least a portion of the passivation layer is configured to provide a plurality of island structures separated spaces that expose a portion of the underlying metal wiring layer, a metal barrier (Col.8, Lines 30-37) covering the passivation layer and the exposed portions of the metal wiring layer, wherein the metal barrier conforms to a shape

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provided by the island structures and a metal pad (12, 16) covering the metal barrier layer; (cl. 41) wherein the metal barrier is substantially the same thickness throughout the bond pad structure, wherein the metal pad (portion of 12) fill the spaces and rises above the island structures; (cl. 43) wherein the passivation layer is selected from the group consisting of silicon oxide, silicon nitride and polyimide (claim 4 of Wollesen); (cl. 44) and the metal pad layer is formed of aluminum ((Col. 4, Lines 56-57).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wollesen (U.S. 5,900,668) in combination with Nogami et al. (U.S. 20020005582).

Wollesen (Fig 5) discloses (cl. 34) a bond pad structure, comprising: a semiconductor substrate (1); comprising interlocking grid structures formed over said semiconductor substrate; a passivating layer (11) forms said, interlocking grid structures, having multiple openings (i.e. spaced taken by vias, 15) to said interlocking grid structures; a barrier layer over (not labeled) said passivating layer and in said openings (Col.8, Lines 30-37); a conducting pad (16) of a conductive material formed over said interlocking grid structures and over said barrier layer; (Col.8,

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Lines 30-37); (35, 38) wherein conductive material includes copper and aluminum (Col. 4, Lines 56-57); (cl. 36) and said passivating layer is selected from the group consisting of silicon oxide, silicon nitride and polyimide (claim 4 of Wollesen).

Wollesen does not disclose the barrier formed from tantalum nitride, or that the conductive pad provides improved adhesion for subsequently formed bonds.

Nogami utilizes a tantalum nitride barrier (Abstract).

It would have been obvious to one of ordinary skill in the art to provide tantalum nitride between the copper and aluminum conductive material disclosed in Wollesen (Col. 4, Lines 56-57), in order to provide a barrier as required by Wollesen (Col.8, Lines 30-37).

In regards to the in intended use limitation of claim 34, "whereby the upper surface of the pad provides for improved adhesion," the prior art satisfies the claimed structural limitation. Hence, the limitation is not given patentable weight, since it has been held that the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex parte Masham*, 2 USPQ2d 1647 (1987).

Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wollesen (U.S. 5,900,668) as applied to claim 40 and further in combination with Nogami et al. (U.S. 20020005582).

Wollesen does not disclose the barrier formed from tantalum nitride.

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Nogami utilizes a tantalum nitride barrier (Abstract) between aluminum and copper.

It would have been obvious to one of ordinary skill in the art to provide tantalum nitride between the copper and aluminum conductive material disclosed in Wollesen (Col. 4, Lines 56-57), in order to provide a barrier as required by Wollesen (Col.8, Lines 30-37).

### ***Allowable Subject Matter***

Claim 37 is allowable.

The following is a statement of reasons for the indication of allowable subject matter: the prior art does not disclose or make obvious the interlocking grid array in the bond pad having contact region, which is approximately 100 by 100 microns square and the size of the island structures are from about 10 to 25 microns in width, approximately 4 microns in height, and from about 4 to 10 in number, of interlocking grid structures, increasing surface area for improved adhesion including all the limitations of the independent claim.

### ***Response to Arguments***

Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection. In order to expedite prosecution of the application, examiner has addressed arguments that may still be relevant.

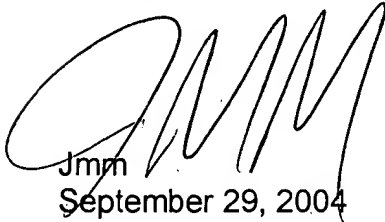
Applicant contends that the prior art does not show a "jagged bond pad surface. Because the limitation is not claimed, the position is deemed immaterial to patentability.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (571) 272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Jmm  
September 29, 2004

  
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